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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/517,627	09/07/2005	John Harold Flexman	WRA0006-US	5671

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EXAMINER
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VARGAS, DIXOMARA

ART UNIT	PAPER NUMBER
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2859

DATE MAILED: 11/02/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/517,627

Applicant(s)

FLEXMAN ET AL.

Examiner

Dixomara Vargas

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-54 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16, 18-26, 30, 31, 33-42 and 44-54 is/are rejected.
- 7) ☒ Claim(s) 17, 27-29, 32 and 43 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 December 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 08/08/06; 08/17/06.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-16, 18-26, 30-31, 33-42 and 44-54 are rejected under 35 U.S.C. 102(b) as being anticipated by Kim et al. (US 6,291,994 B1).

With respect to claims 1, 30, 44, 45, 53 and 54, Kim discloses a receiving system for connection to an antenna arrangement for detecting response signals from a substance (Figure 1, detectors #27, #28 and RF coil #34) having quadrupolar nuclei excited so as to produce nuclear quadrupole resonance therein, the system comprising (Abstract): an amplifier to amplify the received response signal for subsequent processing (#24-#26); and a matching section to match the amplifier to the antenna (#35); wherein the matching section: includes a noise matching circuit to closely noise matches the receiving system to the antenna during a receiving period (Column 6, lines 43-49); and has a low impedance (Column 16, lines 46-48) to reduce the Q factor of the antenna without significantly degrading the signal to noise ratio (Column 14, lines 45-47).

3. With respect to claim 2, Kim discloses the matching section presents an effective lower impedance to the antenna (Column 16, lines 46-48).

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4. With respect to claims 3 and 46, Kim discloses said matching section comprises a damping means to damp stored transmitter energy from the antenna, without effecting further switching or configuration changes (Abstract).
5. With respect to claims 4, 47-49 and 52, Kim discloses isolating means to selectively isolate the antenna from the receiving system; the isolating means including switching means to isolate the receiving system from the antenna during a transmitting period when an excitation signal is transmitted by the antenna to irradiate the substance, and to electrically connect the receiving system to the antenna during the receiving period immediately after the transmitting period (Column 12, lines 22-40).
6. With respect to claims 5 and 50, Kim discloses the isolating means is interposed between the antenna and the matching section to block the high voltage that may be generated on the antenna during the transmitting period (Figure 1, #38-#40).
7. With respect to claim 6, Kim discloses the isolating means includes  $\frac{1}{4}$  wave lines terminated with back to back diodes to provide isolation, in combination with nodes being set close to the amplifier by protection diodes (Figure 1, #38-#40).
8. With respect to claim 7, Kim discloses the isolating means operates through a pi-network that is equivalent to a  $\frac{1}{4}$  wave line in operation, terminated with back-to-back diodes (Column 12, lines 22-40).
9. With respect to claims 8 and 51, Kim discloses the isolating means operates on a change of inductance from a high value to a low value of impedance during the switching process, the low value of the isolating means having impedance that is less than the characteristic input impedance of the matching section (Column 12, lines 22-40).

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10. With respect to claim 9, Kim discloses the isolating means is auto-switching, triggered by monitoring electronically an increase or decrease in input signal level beyond a threshold level (Column 11, lines 52-67).

11. With respect to claim 10, Kim discloses the isolating means is auto-switching, triggered by a second input that monitors electronically an increase or decrease in signal from the transmitter unit output (Column 11, lines 52-67).

12. With respect to claim 11, Kim discloses the isolating means is triggered by a reproducible electrical signal which is synchronized to the transmit sequence (Column 12, lines 22-40).

13. With respect to claims 12 and 21, Kim discloses the switching means has opening and closing characteristics shaped in time (Column 18, lines 14-21).

14. With respect to claim 13, Kim discloses the switching means is not frequency dependent over the general range of NQR lines of interest (Column 15, lines 48-64).

15. With respect to claim 14, Kim discloses said isolation means is followed by a low impedance signal receive circuit that reduces energy in the antenna and remains in the low impedance state during the entire receiving period (Figure 1 as discussed above).

16. With respect to claims 15 and 18, Kim discloses said matching section is constructed from high figure-of-merit transistors to create a close to ambient temperature thermal noise match to the antenna (Column 17, lines 8-35).

17. With respect to claim 16, Kim discloses an additional low impedance, low voltage high-speed semiconductor switch is included after said isolation means to function as a damping switch (Column 18, lines 5-21).

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18. With respect to claim 19, Kim discloses the damping switch is based on a FET or parallel FETs pulse triggering the gate or gates (Column 17, lines 8-35).
19. With respect to claim 20, Kim discloses the damping switch is based on a MOSFET or parallel MOSFETs where the source and drain are connected from the signal input to ground, and that a pulse to the gate triggers the damping switch (Column 17, lines 8-35).
20. With respect to claim 22, Kim discloses the matching section comprises transistors that are JFETs arranged in parallel source and drain connections with their gates at signal ground (Column 17, lines 8-35).
21. With respect to claims 23, 25 and 31, Kim discloses the matching section comprises a plurality of JFET transistors arranged in a cascade arrangement with a negative feedback circuit (Column 17, lines 8-35).
22. With respect to claim 24, Kim discloses bipolar transistors are provided at the source connection of the JFETs (Column 17, lines 8-35).
23. With respect to claim 26, Kim discloses the negative feedback circuit is a capacitor or inductor combination (Column 17, lines 8-35).
24. With respect to claims 33-35, Kim discloses a selected number of low forward voltage diodes, arranged back-to-back, are included at the input to signal ground of the matching section (Figures 1 and 6-14).
25. With respect to claim 36-38, Kim discloses an antenna arrangement having more than one output, the voltage at each output having approximately the same magnitude and wherein the signal from each output passes through separate receive channels that are identical or non-identical (Figures 1 and 6-14).

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26. With respect to claim 39, Kim discloses the receiving antenna includes a coil with two ends, where the signal from each end is approximately equal in magnitude but opposite in polarity relative to a signal ground point located in between the two ends (Figure 1).

27. With respect to claims 40 and 41, Kim discloses the isolating means has two differential inputs and two balanced outputs with respect to ground, and the matching section has two differential inputs and a single output relative to ground (Figure 1).

28. With respect to claim 42, see rejection of claims 3 and 11 above.

***Allowable Subject Matter***

29. Claims 17, 27-29, 32 and 43 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

30. The following is a statement of reasons for the indication of allowable subject matter:

a. With respect to claim 17, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a receiving system for connection to an antenna arrangement for detecting response signals from a substance having quadrupolar nuclei excited so as to produce nuclear quadrupole resonance therein, the system comprising a damping switch that has predetermined transition rates so as not to re-excite the antennae through parasitic capacitance or changes in state in combination with the remaining limitations of claims 1 and 16 above.

b. With respect to claim 27, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a receiving system

for connection to an antenna arrangement for detecting response signals from a substance having quadrupolar nuclei excited so as to produce nuclear quadrupole resonance therein, the system comprising the negative feedback circuit is resistive with most of the fed-back current being conveyed away from the signal input to signal ground through a capacitive or inductive divider in combination with the remaining limitations of claims 1 and 23 above.

c. With respect to claim 28, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a receiving system for connection to an antenna arrangement for detecting response signals from a substance having quadrupolar nuclei excited so as to produce nuclear quadrupole resonance therein, the system comprising the bandwidth of the matching section is limited in gain by a tuned circuit in combination with the remaining limitations of claim 1 above.

d. With respect to claim 29, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a receiving system for connection to an antenna arrangement for detecting response signals from a substance having quadrupolar nuclei excited so as to produce nuclear quadrupole resonance therein, the system comprising the chosen bandwidth would typically lie in a range from 1kHz to 200kHz in combination with the remaining limitations of claims 1 and 28 above.

e. With respect to claim 32, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a receiving system for connection to an antenna arrangement for detecting response signals from a substance having quadrupolar nuclei excited so as to produce nuclear quadrupole resonance therein,



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the system comprising a feedback circuit is resistive with most of the feedback current being diverted away from the signal input through a capacitive or inductive divider in combination with the remaining limitations of claims 1, 30 and 31 above.

f. With respect to claim 43, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a receiving system for connection to an antenna arrangement for detecting response signals from a substance having quadrupolar nuclei excited so as to produce nuclear quadrupole resonance therein, the system comprising the matching section is cooled to obtain improve thermal and shot noise performance in combination with the remaining limitations of claim 1 above.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dixomara Vargas whose telephone number is (571) 272-2252. The examiner can normally be reached on Monday to Thursday from 8:00 am. to 4:30 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on (571) 272-2245. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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Art Unit 2859  
October 24, 2006



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